

Claims:

1. A method for preparing a water- and oil-repellent agent, which comprises conducting a copolymerization reaction of the following monomers i) to v) in a mixed solution of water and an organic dissolution agent by using a free radical initiator and in the presence of an ionic
5 surfactant, a non-ionic surfactant, and a chain transfer agent:

i) a perfluoroalkyl (meth)acrylate mixture with the following formula:
 $R^f-Q-OCOCR^1=CH_2$;

wherein R^1 is H or methyl, R^f is a perfluoro C_{2-20} alkyl, and Q is $-(CH_2)_{p+q}-$,
10 $-(CH_2)_pCONH(CH_2)_q-$, $-(CH_2)_pOCONH(CH_2)_q-$, $-(CH_2)_pSO_2NR^2(CH_2)_q-$,
 $-(CH_2)_pNHCONH(CH_2)_q-$ or $-(CH_2)_pCH(OH)-(CH_2)_q-$, wherein R^2 is H or
C1-C4 alkyl, p and q separately represent an integer of more than 0, and $p+q$
= 1~22;

ii) C2-C20 alkyl (meth)acrylate;

15 iii) hydroxy C2-C6 alkyl (meth)acrylate;

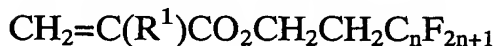
iv) poly(oxy C2-C4 alkylene glycol) mono(meth)acrylate having a
number average molecular weight of 100-800;

v) C2-C4 alkene, fluoro- or chloro-containing C2-C4 alkene, or
butadiene;

20 wherein the monomer ii) is of 10-70 wt%, the monomer iii) is of 0.5-7
wt%, the monomer iv) is of 0.1-40 wt%, the monomer v) is of 10-50 wt%,
the free radical initiator is of 0.1-2 wt%, the water is of 100-400 wt%, the
organic dissolution agent is of 40-200 wt%, the ionic surfactant is of 2-8
wt%, the non-ionic surfactant is of 8-30 wt%, and the chain transfer agent is
25 of 0.1-2 wt%, based on the weight of the monomer i).

2. The method as claimed in Claim 1, wherein the copolymerization reaction is conducted at 25~100°C.

3. The method as claimed in Claim 1, wherein said perfluoroalkyl (meth)acrylate mixture i) has the following formula:



wherein R^1 is H or methyl, and n represents integers selected from the group consisting of 6, 8, 10, 12, 14 and 16.

4. The method as claimed in Claim 1, wherein said C2-C20 alkyl (meth)acrylate ii) is stearyl (meth)acrylate, and the monomer ii) is of 20-40 wt%, based on the weight of the monomer i).

5. The method as claimed in Claim 1, wherein said hydroxy C2-C6 alkyl (meth)acrylate iii) is 2-hydroxyethyl (meth)acrylate, and the monomer iii) is of 1.5-5 wt%, based on the weight of the monomer i).

6. The method as claimed in Claim 1, wherein said poly(oxy C2-C4 alkylene glycol) mono(meth)acrylate iv) is poly(oxyethylene glycol) mono(meth)acrylate having a number average molecular weight of about 400, and the monomer iv) is of 1.5-5 wt%, based on the weight of the monomer i).

7. The method as claimed in Claim 1, wherein said monomer v) is vinylidene chloride, and the monomer v) is of 20-40 wt%, based on the weight of the monomer i).

8. The method as claimed in Claim 1, wherein a monomer vi) is added copolymerized with said monomers i) to v), wherein said monomer vi) is hydroxy C2-C6 alkyl (meth)acrylamide and the monomer vi) is of 0.5-7 wt%, based on the weight of the monomer i).

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9. The method as claimed in Claim 8, wherein said monomer vi) is N-methylolacrylamide and the monomer vi) is of 1.5-5 wt%, based on the weight of the monomer i).

10 10. The method as claimed in Claim 1, wherein said free radical initiator is an organic peroxide or an azo compound.

11. The method as claimed in Claim 10, wherein said free radical initiator is 2,2'-azobis(2-amidinopropane)dihydrochloride.

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12. The method as claimed in Claim 1, wherein said organic dissolution agent is a ketone of the following formula: R^3COR^4 , wherein R^3 and R^4 independently are C_{1-4} alkyl.

20 13. The method as claimed in Claim 12, wherein said organic dissolution agent is acetone.

14. The method as claimed in Claim 1, wherein said organic dissolution agent is an alkylene glycol monomethyl ether of the following
25 formula: $HO-(C_mH_{2m}O)_r-CH_3$, wherein $m = 2-4$ and $r = 1-3$.

15. The method as claimed in Claim 14, wherein said organic dissolution agent is dipropylene glycol monomethyl ether.

16. The method as claimed in Claim 1, wherein said ionic surfactant is
5 a C12-C26 alkyltrimethylammonium halide, wherein said halide is Cl, Br or I.

17. The method as claimed in Claim 16, wherein said ionic surfactant is trimethyl stearyl ammonium chloride.

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18. The method as claimed in Claim 1, wherein said non-ionic surfactant is an alkylphenylene polyoxyethylene glycol, a polyoxyethylene glycol monofattyacid ester, or a mixture of them, wherein said alkylphenylene polyoxyethylene glycol has the following formula:

15 $R^5\text{Ph}(\text{OCH}_2\text{CH}_2)_t\text{-OH}$, wherein R^5 is an C6-C20 alkyl, Ph is phenylene, and $t = 3\sim 20$; and said polyoxyethylene glycol monofattyacid ester has the following formula: $R^6\text{CO}(\text{OCH}_2\text{CH}_2)_t\text{-OH}$, wherein R^6 is a C2-C26 alkyl, and t is defined as above.

20 19. The method as claimed in Claim 18, wherein said non-ionic surfactant is nonylphenylene polyoxyethylene glycol having a number average molecular weight of about 880.

20. The method as claimed in Claim 18, wherein said non-ionic
25 surfactant is poly(oxyethylene glycol)monolaurate having a number average molecular weight of about 375.

21. The method as claimed in Claim 1, wherein said chain transfer agent is 1-dodecanthiol.

22. The method as claimed in Claim 1, wherein said copolymerization
5 reaction is conducted under agitation, and the copolymer obtained by said copolymerization reaction is in the form of particles with a particle size less than 200 nm.

23. The method as claimed in Claim 22, wherein said agitation is a
10 mechanical agitation at 250 to 400 rpm, and the copolymer obtained by said copolymerization reaction is in the form of particles with an average particle size of about 100 nm.

24. A method for preparing a water- and oil-repellent agent, which
15 comprises conducting a copolymerization reaction of the following monomers i) to vi) in a mixed solution of water and an organic dissolution agent by using a free radical initiator and in the presence of an ionic surfactant, a non-ionic surfactant, and a chain transfer agent:

i) a perfluoroalkyl (meth)acrylate mixture with the following formula:

20 $\text{CH}_2=\text{C}(\text{R}^1)\text{CO}_2\text{CH}_2\text{CH}_2\text{C}_n\text{F}_{2n+1}$

wherein R^1 is H or methyl, and n represents integers selected from the group consisting of 6, 8, 10, 12, 14 and 16.

ii) stearyl (meth)acrylate;

iii) 2-hydroxyethyl (meth)acrylate;

25 iv) poly(oxyethylene glycol) mono(meth)acrylate having a number average molecular weight of about 400;

v) vinylidene chloride;

vi) N-methylolacrylamide;

wherein the monomer ii) is of 20-40 wt%, the monomer iii) is of 1.5-5 wt%, the monomer iv) is of 1.5-5 wt%, the monomer v) is of 20-40 wt%, the monomer vi) is of 1.5-5 wt%, the free radical initiator is of 0.1-2 wt%, the water is of 100-400 wt%, the organic dissolution agent is of 40-200 wt%, the ionic surfactant is of 2-8 wt%, the non-ionic surfactant is of 8-30 wt%, and the chain transfer agent is of 0.1-2 wt%, based on the weight of the monomer i),

wherein said organic dissolution agent is a ketone of the following formula: R^3COR^4 , wherein R^3 and R^4 independently are C_{1-4} alkyl; or an alkylene glycol monomethyl ether of the following formula:

$HO-(C_mH_{2m}O)_r-CH_3$, wherein $m = 2-4$ and $r = 1-3$;

said ionic surfactant is a C12-C26 alkyltrimethylammonium halide, wherein said halide is Cl, Br or I; and

said non-ionic surfactant is an alkylphenylene polyoxyethylene glycol, a polyoxyethylene glycol monofattyacid ester, or a mixture of them, wherein said alkylphenylene polyoxyethylene glycol has the following formula: $R^5Ph(OCH_2CH_2)_t-OH$, wherein R^5 is an C6-C20 alkyl, Ph is phenylene, and $t = 3-20$; and said polyoxyethylene glycol monofattyacid ester has the following formula: $R^6CO(OCH_2CH_2)_t-OH$, wherein R^6 is a C2-C26 alkyl, and t is defined as above.

25. The method as claimed in Claim 24, wherein said copolymerization reaction is conducted at a temperature of 25~100°C.

26. The method as claimed in Claim 24, wherein said free radical initiator is an organic peroxide or an azo compound.

27. The method as claimed in Claim 26, wherein said free radical initiator is 2,2'-azobis(2-amidinopropane)dihydrochloride.

5 28. The method as claimed in Claim 24, wherein said organic dissolution agent is acetone.

29. The method as claimed in Claim 24, wherein said organic dissolution agent is dipropylene glycol monomethyl ether.

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30. The method as claimed in Claim 24, wherein said ionic surfactant is trimethyl stearylammmonium chloride.

31. The method as claimed in Claim 24, wherein said non-ionic
15 surfactant is nonylphenylene polyoxyethylene glycol having a number average molecular weight of about 880.

32. The method as claimed in Claim 24, wherein said non-ionic
surfactant is poly(oxyethylene glycol)monolaurate having a number average
20 molecular weight of about 375.

33. The method as claimed in Claim 24, wherein said chain transfer agent is 1-dodecanthiol.

25 34. The method as claimed in Claim 24, wherein said copolymerization reaction is conducted under agitation, and the copolymer

obtained by said copolymerization reaction is in the form of particles with a particle size less than 200 nm.

35. The method as claimed in Claim 34, wherein said agitation is a
5 mechanical agitation at 250 to 400 rpm, and the copolymer obtained by said copolymerization reaction is in the form of particles with an average particle size of about 100 nm.